CLAIMS

1. An integrated VCO comprising:

a substrate;

a VCO tuning control circuit responsive to a VCO state variable that is disposed upon the substrate; and

a VCO disposed upon the substrate, having a tuning control voltage input falling within a VCO tuning range for adjusting a VCO frequency output, and having the tuning range adjusted by the tuning control circuit in response to the VCO state variable.

2. The integrated VCO of claim 1, wherein the VCO state variable is the tuning control voltage.

3. The integrated VCO of claim 1, wherein the VCO tuning control circuit further includes a feedback network having a resonant frequency that varies with the tuning control voltage input and a set of control signals that act on the feedback network to change the tuning range.

4. The integrated VCO of claim 3, wherein the feedback network further includes a bank of switched capacitors acted upon by the set of control signals to change the tuning range.

5. The integrated VCO of claim 1, wherein the VCO tuning control circuit includes:

a window detector comparing a signal derived from a PLL loop filter output to a fixed voltage difference between an upper and a lower threshold that define a window;

a compensation circuit coupled to the window detector that simultaneously adjusts the upper and lower thresholds in

response to temperature and process variations while maintaining the fixed voltage difference; and

a tuning register coupled to the output of the window detector generating a VCO tuning range adjustment signal.

6. The integrated VCO of claim 1, wherein the VCO is a negative g_m LC oscillator.

7. The integrated VCO of claim 1, wherein the VCO includes NMOS transistors configured to provide a capacitance that varies in response to an applied control voltage.

8. The integrated VCO of claim 1, wherein the VCO includes an adaptive bias circuit.

9. The integrated VCO of claim 8, in which the adaptive bias circuit includes a PMOS transistor having its source to drain coupled in series with a power supply line.

10. The integrated VCO of claim 1, additionally including an adjustable capacitance responsive to the tuning control voltage.

11. The integrated VCO of claim 10, in which the adjustable capacitance includes:

a first NMOS transistor configured as a varactor with its gate coupled to the second terminal of the first inductor and with its source and drain coupled to a control voltage source; and

a second NMOS transistor configured as a varactor with its gate coupled to the second terminal of the second inductor and with its source and drain coupled to a control voltage source.

12. The integrated VCO of claim 10, in which the adjustable capacitance includes:

a first field effect transistor with its gate coupled to the second terminal of the first inductor and with its source and drain coupled to a control voltage source;

a second field effect transistor with its gate coupled to the second terminal of the second inductor and with its source and drain coupled to a control voltage source; and

whereby the control voltage is applied at a virtual ground such that the adjustable capacitance formed is an adjustable capacitance in parallel with the series of switched capacitors.

13. The integrated VCO of claim 10, in which the series of switched capacitors include:

a transistor switch; and

a capacitance in series with the transistor switch.

14. The integrated VCO of claim 13 in which the capacitance further comprises a metal fringe capacitor.

15. An integrated VCO comprising:

a substrate;

a VCO disposed upon the substrate, having an adjustable frequency output responsive to a control voltage that is variable within an adjustable tuning range; and

a VCO tuning control circuit responsive to temperature and process variations and a tuning control voltage input falling within a fixed VCO tuning window, the window having a first threshold voltage in fixed relation to a second threshold voltage the first and second threshold voltages being adjusted in fixed relation to each other to modify an adjustable tuning range of the VCO.

16. A method of controlling stability of frequency output of a voltage controlled oscillator (VCO) over temperature and process variations, the VCO having a tank circuit with a tank circuit resonant frequency, the tank circuit including switched capacitors and varactors, the varactors being responsive to a varactor bias frequency output control voltage, the method comprising:

providing a temperature and process dependent moving voltage window, the temperature and process dependent moving voltage window defining upper and lower limits of a VCO voltage control range and maintaining a constant differential voltage between the upper and lower limits;

deriving VCO control voltages from the temperature and process dependent moving voltage window; and

applying the VCO control voltages to the switched capacitors to set a frequency tuning range for the tank circuit.

17. The method of claim 16, wherein the varactor bias frequency output control voltage adjusts frequency within the frequency tuning range set by the VCO control lines.

18. The method of claim 16, wherein the temperature and process dependent moving voltage window is established by comparing a voltage derived from the varactor bias frequency output control voltage with temperature and process dependent reference voltages.

19. The method of claim 16, wherein the VCO forms part of a phase locked loop (PLL) and the applying the VCO control voltages to the switched capacitors to adjust the tank circuit resonant frequency is used to improve frequency lock for the PLL over the temperature and process variations.

21 20. A process for establishing a range of VCO control voltages that establish a PLL lock condition comprising:

evaluating a state variable derived from a PLL loop filter;

comparing the state variable to a predefined sliding window comprising a fixed difference between an upper and a lower limit, in which the upper and lower limits to change in response to temperature and process variations, while maintaining the fixed relationship between upper and lower limits;

shifting zeroes through a shift register if the state variable exceeds the upper limit of the predefined sliding window to decrease the VCO tank capacitance;

shifting ones through the shift register if the state variable is less than the lower limit of the predefined sliding window to increase the VCO tank capacitance;

disabling the shift register if the state variable falls within the predefined sliding window while continuing to monitor the state variable;

initiating a timer when the state variable falls within the predefined sliding window;

timing the time the state variable remains within the predefined window;

comparing the time the state variable remains within the predefined window to a predefined time limit;

producing an inlock flag if the state variable remains within the predefined window for a predefined time; and

disabling the control circuit upon completion of the tuning process.

21. An integrated VCO comprising:

a substrate means for supporting the disposition of an integrated circuit;

a VCO means for producing a range of frequencies in response to a changing voltage input; and

a VCO control circuit means for changing the range of frequencies produced in response to the changing voltage input through the use of a temperature and process independent sliding window.